

What is claimed is:

1. A mask plate apparatus for use in an electrochemical processing device in which a solution becomes disposed onto a workpiece and electrochemical processing of the workpiece is performed while relative movement and physical contact exists between the apparatus and a top surface of the workpiece, the apparatus comprising:

a pad having a top surface and a bottom surface, the top surface including a processing area that aligns with the workpiece;

at least one channel formed in the top surface of the pad within the processing area;

at least one contact portion formed in the top surface of the pad at a location different than the at least one channel;

at least one hole disposed between the top surface and the bottom surface of the pad within the at least one channel so that the solution can flow therethrough and into the at least one channel when the physical contact exists with the workpiece,

and wherein the at least one channel further includes an edge channel portion adapted to allow the solution to flow therethrough and out of the channel when the physical contact exists with the workpiece.

2. The apparatus according to claim 1 wherein the at least one channel is disposed radially from a center portion of the pad to an edge portion of the pad.

3. The apparatus according to claim 2 wherein a plurality of holes are disposed between the top surface and the bottom surface of the pad within the at least one channel.

4. The apparatus according to claim 3 wherein the plurality of holes are dimensioned to provide a greater flow of the solution at an edge portion of the pad than in a central portion of the pad.

5. The apparatus according to claim 4 wherein those holes that are disposed in the central portion of the pad are smaller than other holes disposed in the edge portion of the pad

6. The apparatus according to claim 2 wherein the channel is V shaped.

7. The apparatus according to claim 2 further including a plurality of channels formed in the top surface of the pad within the processing area,

5 at least one hole disposed between the top surface and the bottom surface of the pad within each of the plurality of channels so that the solution can flow therethrough and into each of the plurality of channels when the physical contact exists with the workpiece,

and wherein each of the plurality of channels further includes the edge channel portion adapted to allow the solution to flow therethrough and out of the channel when the physical
10 contact exists with the workpiece.

8. The apparatus according to claim 7 wherein each of the plurality of channels is V shaped.

15 9. The apparatus according to claim 1 wherein a plurality of holes are disposed between the top surface and the bottom surface of the pad within the at least one channel.

10. The apparatus according to claim 9 wherein the plurality of holes are dimensioned to provide a greater flow of the solution at an edge portion of the pad than in a central portion of the pad.
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11. The apparatus according to claim 10 wherein those holes that are disposed in the central portion of the pad are smaller than other holes disposed in the edge portion of the pad

25 12. The apparatus according to claim 10 wherein the holes have four sides, two opposite sides being parallel to edges of the channel, and the other two opposite sides having a shape corresponding to a radius from a corresponding center portion of the pad.

13. The apparatus according to claim 1 further including a plurality of channels formed in
30 the top surface of the pad within the processing area,

at least one hole disposed between the top surface and the bottom surface of the pad within each of the plurality of channels so that the solution can flow therethrough and into each of the plurality of channels when the physical contact exists with the workpiece,

and wherein each of the plurality of channels further includes the edge channel portion adapted to allow the solution to flow therethrough and out of the channel when the physical contact exists with the workpiece.

14. The apparatus according to claim 13 wherein each of the plurality of channels are parallel to each other.

15. The apparatus according to claim 14 wherein the at least one hole in each of the plurality of channels is a slit.

16. The apparatus according to claim 15 wherein each slit extends past an edge region of the workpiece to allow the solution to flow therethrough and out of the channel when the physical contact exists with the workpiece.

17. The apparatus according to claim 13 wherein the plurality of channels are arranged to allow a relatively greater amount of processing to occur on a center region of the workpiece than an edge region of the workpiece.

18. The apparatus according to claim 17 wherein each of the plurality of channels are parallel to each other, and each of the plurality of parallel channels have a greater width in a center portion of the pad corresponding to the center region of the workpiece.

19. The apparatus according to claim 13 wherein the plurality of channels are arranged to allow a relatively greater amount of processing to occur on an edge region of the workpiece than a center region of the workpiece.

20. The apparatus according to claim 19 wherein each of the plurality of channels are parallel to each other, and each of the plurality of parallel channels have a greater width in an edge portion of the pad corresponding to the edge region of the workpiece.

21. The apparatus according to claim 1 wherein the at least one hole is a slit.

22. The apparatus according to claim 6 wherein the substantially all of the channel includes the slit.

23. The apparatus according to claim 1 wherein the at least one contact portion includes abrasive materials disposed thereon.

24. An electrochemical processing device in which a solution becomes disposed onto a workpiece and electrochemical processing of the workpiece is performed, the apparatus comprising:

a terminal adapted to receive an electric potential;

at least one electrical contact adapted to establish electrical contact with the workpiece and receive another electric potential, and thereby adapted to establish a potential difference between the terminal and the workpiece so that electrochemical processing can occur in the presence of the solution; and

a mask plate adapted to establish physical contact with the workpiece during a portion of the electrochemical processing and located adjacent to the at least one electrical contact, such that relative movement of the mask plate and the workpiece causes an edge contact region of the workpiece to maintain electrical contact with an edge region of the workpiece while still allowing for the electrochemical processing to occur on a full face of the workpiece, the mask plate including:

a pad having a top surface and a bottom surface, the top surface including a processing area that aligns with the workpiece;

at least one channel formed in the top surface of the pad within the processing area, the at least one channel configured to allow a substantially equal amount of processing to occur on a center region of the workpiece and the edge region of the workpiece;

at least one contact portion formed in the top surface of the pad at a location different than the at least one channel; and

at least one hole disposed between the top surface and the bottom surface of the pad within the at least one channel so that the solution can flow therethrough and into the at least one channel when the physical contact exists with the workpiece.

25. The apparatus according to claim 24 further including at least two electrical contacts adapted to establish electrical contact with the workpiece and receive another electric potential, wherein the mask plate is adjacent to each electrical contact.

26. The apparatus according to claim 25 wherein the mask plate is substantially rectangular, and the at least two electrical contacts are disposed on opposite sides of the mask plate.

27. The apparatus according to claim 24 further including a plurality of channels formed in the top surface of the pad within the processing area, and

at least one hole disposed between the top surface and the bottom surface of the pad within each of the plurality of channels so that the solution can flow therethrough and into each of the plurality of channels when the physical contact exists with the workpiece,

28. The apparatus according to claim 27 wherein each of the plurality of channels are parallel to each other.

29. The apparatus according to claim 26 wherein the at least one hole in each of the plurality of channels is a slit.

30. The apparatus according to claim 29 wherein each slit extends past an edge region of the workpiece to allow the solution to flow therethrough and out of the channel when the physical contact exists with the workpiece.

31. The apparatus according to claim 27 wherein each of the plurality of channels further includes an edge channel portion adapted to allow the solution to flow therethrough and out of the channel when the physical contact exists with the workpiece.

5 32. The apparatus according to claim 24 wherein the at least one channel further includes an edge channel portion adapted to allow the solution to flow therethrough and out of the channel when the physical contact exists with the workpiece.

10 33. The apparatus according to claim 32 wherein the plurality of parallel channels have a greater width in an edge portion of the pad corresponding to the edge contact region of the workpiece that does not always remain in physical contact with the pad.

15 34. A method of processing a workpiece with a solution comprising:
 electrochemically processing a workpiece in the presence of a solution, the step
 electrochemically processing including:
 flowing the solution through at least one hole in a pad to at least one channel
 portion of a top surface of the pad when a contact portion on the top surface of the pad
 physically contacts the workpiece; and
 causing the solution to flow out of the at least one channel portion due to the at
 20 least one channel portion including an edge channel portion adapted to allow the solution to
 flow therethrough and out of the channel when the physical contact exists with the contact
 portion of the pad the workpiece when continuing to introduce solution into the at least one
 channel.

25 35. A method according to claim 34 wherein the steps of flowing and causing flow the solution through each of a plurality of channel portions that each include an edge channel portion.

30 36. A mask plate apparatus for use in an electrochemical processing device in which a solution becomes disposed onto a workpiece and electrochemical processing of the workpiece

is performed while relative movement and physical contact exists between the apparatus and a top surface of the workpiece, the apparatus comprising:

a pad having a top surface and a bottom surface, the top surface including a processing area that aligns with the workpiece;

at least one channel formed in the top surface of the pad within the processing area, the at least one channel configured to allow a relatively greater amount of processing to occur on one region of the workpiece than another region of the workpiece;

at least one contact portion formed in the top surface of the pad at a location different than the at least one channel; and

at least one hole disposed between the top surface and the bottom surface of the pad within the at least one channel so that the solution can flow therethrough and into the at least one channel when the physical contact exists with the workpiece.

37. The apparatus according to claim 36 wherein the one region is a center region of the workpiece and the another region is an edge region of the workpiece.

38. The apparatus according to claim 36 wherein the one region is an edge region of the workpiece and the another region is a center region of the workpiece.

39. The apparatus according to claim 36 further including a plurality of channels formed in the top surface of the pad within the processing area,

at least one hole disposed between the top surface and the bottom surface of the pad within each of the plurality of channels so that the solution can flow therethrough and into each of the plurality of channels when the physical contact exists with the workpiece.

40. The apparatus according to claim 39 wherein the one region is a center region of the workpiece and the another region is an edge region of the workpiece.

41. The apparatus according to claim 40 wherein each of the plurality of channels are parallel to each other, and each of the plurality of parallel channels have a greater width in a center portion of the pad corresponding to the center region of the workpiece.

42. The apparatus according to claim 39 wherein the one region is an edge region of the workpiece and the another region is a center region of the workpiece.

43. The apparatus according to claim 42 wherein each of the plurality of channels are parallel to each other, and each of the plurality of parallel channels have a greater width in an edge portion of the pad corresponding to the edge region of the workpiece.

44. The apparatus according to claim 39 wherein each of the plurality of channels has a gradually changing width between a center portion of the pad and an edge portion of the pad.

45. The apparatus according to claim 44 wherein the one region is a center region of the workpiece and the another region is an edge region of the workpiece.

46. The apparatus according to claim 44 wherein the one region is an edge region of the workpiece and the another region is a center region of the workpiece.

47. The apparatus according to claim 38 wherein each of the plurality of channels is V shaped.

48. The apparatus according to claim 38 wherein each of the plurality of channels are parallel to each other.

49. The apparatus according to claim 38 wherein the at least one hole in each of the plurality of channels is a slit.

50. The apparatus according to claim 49 wherein each slit extends past an edge region of the workpiece to allow the solution to flow therethrough and out of the channel when the physical contact exists with the workpiece.